

## **ABSTRACT**

**[0118]** The methods and apparatus disclosed herein concern nucleic acid characterization by enhanced Raman spectroscopy. In certain embodiments of the invention, exonuclease treatment of the nucleic acids results in the release of nucleotides. The nucleotides may pass from a reaction chamber through a microfluidic channel and enter a nanochannel or microchannel. The nanochannel or microchannel may be packed with nanoparticle aggregates containing hot spots for Raman detection. As the nucleotides pass through the nanoparticle hot spots, they may be detected by Raman spectroscopy. Identification of the sequence of nucleotides released from the nucleic acid is used to characterize the nucleic acid, for example by sequencing or identifying the nucleic acid. Other embodiments of the invention concern apparatus for nucleic acid sequencing.